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Capturing and Representing Deliberation in Participatory Planning Practices

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Abstract: In this paper we argue for the importance of capturing and representing deliberation in participatory planning practices. We discuss the concept of deliberation in planning theory, and argue for a paradigm that puts deliberation at the centre of public participation to planning decision. We argue that in order to enable effective participation, the normally ephemeral deliberation process needs to be captured and represented so that the information and knowledge gathered during deliberation is visible for all, can be effectively traced, reused, and can actively influence planning decisions. To scaffold this we describe the integration of three technologies to create a collective project memory structured against five dimensions of participatory planning processes: dialogical, social, spatial, temporal and causal. Based on several authentic participatory planning cases, we report that this supported deliberation across planning tasks, communication modes, time and environments. The coupled use of online and offline groupware technologies created a more expressive and transparent participatory knowledge base than is possible with conventional media, and enhanced participatory planning by: supporting the effective capture and representation of deliberation processes and products; providing a rich picture of the social setting in which planning decision develops and supporting reflection in and on planning actions.

1. Introduction

A growing body of evidence confirms that in the hands of appropriately skilled facilitators and analysts, software tools for mapping the structure of deliberations and arguments can be used successfully to add value to policy consultations by clarifying the relationships between key issues, positions and arguments (e.g. Renton and Macintosh 2007; Ohl 2008; van Gelder 2003). Extending beyond policy consultations, such tools are sometimes used for real time mapping to add immediate value in meetings, both face-to-face and online, in a wide range of contexts including science (e.g. Conklin 2006; Buckingham Shum and Sierhuis, 2008). Conklin (2003) documents the use of one such tool to capture the organizational memory of an environmental policy body for over ten years.

IBIS (Kuntz and Rittel 1972) is increasingly emerging as a 'lingua franca' for introducing relatively simple semantic structure to online deliberation. Platforms such as *Cohere* (Buckingham Shum 2008), *Collaboratorium* (Klein and Iandoli 2008) and *Debategraph* (<http://debategraph.org>) are prominent examples of the maturation of IBIS-based tools and their use and development to support online deliberation. In particular some applications have been devoted to building new forms of policy memories oriented to perform informed deliberation processes (Elliman, Macintosh et al. 2006; Renton and Macintosh 2007). These latter contributions provide evidence of the advantages of argument visualization tools to structure and represent deliberation in policy formulation.

However, to date, no specific applications to the Participatory Planning field are reported in the literature. In this paper we focus on participatory urban and environmental planning practices and on the challenges of capturing and representing deliberation in modern planning arenas. We

contextualize the role of deliberation to participatory planning practices and propose a paradigm of Participatory Planning as sensemaking performed through deliberation (§2). Consequently, we focus on the importance of capturing and representing deliberation, and we propose the combined use of three groupware technologies to support this in several contexts, including face-to-face planning team meetings, online deliberation with local communities, and face-to-face public consultation meetings (§3). We describe the three tools (*Compendium*, *FM* and *CoPe_it!* §4-6) and discuss the outcomes of their integration as tested in three participatory planning cases. We summarize the results of the technology deployments, and briefly discuss users' feedback from the evaluation studies. We conclude by reflecting on the role played by technologies in enabling the capture and representation of deliberation process to more effectively reflect, understand and critique the content and the context of deliberation, in the very attempt to provide a wider and more transparent body of knowledge to inform decision-making. (§7).

2. Role of Deliberation in Planning Theory

The concept of deliberative democracy and citizen involvement in planning practices has deep roots in planning theory. It developed and evolved from one theory to another, changing the emphasis given to different aspects and issues related to the problem of participation in planning practices. In particular the concept of planning as communicative process dates back to Habermas's communicative rationality. Habermas introduced a utopian model of communicative arena in which all participants know and share communication rules and objectives, and have access to the same exhaustive base of information (Habermas 1981). These conditions are not realistic in a genuine deliberative arena, where information and power are non-homogeneously distributed, rules are unknown or misunderstood, and objectives are often hidden and adversary. Based on this assumption, we consider Habermas's point of departure, at the most, as a utopian vision to which planning as communicative process could aim.

Our approach builds on the idea of deliberative arenas but takes a more practical metaphor of design as "making sense together in practical conversation" (Forester 1984). This metaphor was first proposed by Forester in the early 1980s, and argues that planning should be construed as sensemaking, aiming to build mutual understanding through a process of design deliberation which involves diverse expertise, organizations, interests groups and community members. In such an approach, participation and citizen involvement should not manifest as a mere 'translation' of community knowledge into technical language, nor should it be an attempt to devolve planning tasks and responsibilities to the community level. Participation is, rather, part of the design process conceived as "sensemaking", that is an interpretative process of problem-definition and problem-setting, a process of making sense together in practical planning conversation.

"Planning conversations" are highly constrained by organizational, political and cultural forces, and are practical in the sense of being compelled by contingent issues and case-specific topics. Examples of planning conversations are project meetings, consultation meetings with the local communities, and approval or permits meetings with environmental and institutional bodies. All these can be seen as components of the sensemaking processes through which participants make sense of the problematic context, and discover other peoples' values and positions. The deliberation process does not necessarily result in agreements on certain values or positions, but it plays a key role in helping stakeholders understand the different arguments and counterarguments at stake. An effective participatory deliberation process should involve careful and mature reflection on (ideally) all relevant issues at stake, by all relevant stakeholders exchanging views on the nature of the problems, and the reasons for and against potential courses of action. Although it is rarely possible to satisfy everyone all of the time, a sense of ownership and trans-

parency around this process will increase the chances of design decisions that translate into better living environments. When trust breaks down, the participatory process has failed.

The core of our work is to understand how this deliberation process can be captured and made available in appropriate ways, using digital tools in appropriate ways, and to understand the practices and skillsets that this requires (we focus on the latter elsewhere, e.g. Conklin, 2006; Selvin, *et al.* 2010). Can the normally ephemeral deliberation process be made tangible as an object for critique and reflection? In particular, by representing deliberation the conversation dynamics are made transparent and a social picture may be drawn of the social process, which helps planners and decision-makers to analyze the social, political and cultural setting in which planning develops. Moreover by representing deliberation we build a database of people's statements that may be used to explore possible implications of planning choices in the social and organizational context (aspects that could likely elude the technical analysis conduct by the planner). If we assume that deliberation, be it a way to seek common ground through dialogue or be it a way to defend your rights through argument and debate, is how participatory planning happens, therefore deliberation is at the heart of the matter in public participation to planning decisions. The challenge for the planner is then to support deliberation by capturing and representing results of diverse planning conversations into a unique and coherent deliberation process, in which it is made clear what 'voices' have been listened to, in which social context, and how they affect the deliberation process toward planning decisions.

3. Capturing deliberation across planning tasks, communication modes, time and environments

In the previous sections we argued that deliberation is a reflective practice, in which stakeholders should be able to stop and reflect on the results of the deliberation and analyze information and knowledge gathered. In order to enable such a reflective practice, deliberation needs to be captured beforehand and deliberation contents, that is to say all the information and knowledge gathered along the deliberation process, need to be structured and represented. The first issue to solve in this sense is defining where deliberation happens and therefore how we can capture, structure and represent deliberation contents in a way that enables stakeholders to reflect, re-interpret, re-use, and re-purpose those contents in new effective ways. Defining 'where' deliberation happens in modern planning arenas is a complex problem per se. In fact, participatory planning processes are collaborative decision-making processes in which several stakeholders deliberate in different moments, trying to accomplish different tasks, collaborating with different people, working in different organizations and communicating through different media. Moreover, the widespread diffusion of the Web has added a further level of complexity. Since people increasingly use the Web to communicate and work together, information and knowledge exchanged in virtual environments and within virtual communities matters increasingly, and needs to be integrated with other more common forms of information and knowledge gathered through face-to-face interactions. While online interaction makes deliberation easier and faster, a new problem is emerging around how to manage and integrate information and knowledge that comes from different deliberation environments in a unique and coherent deliberation process. In Table 1 we have classified nine deliberation typologies that vary with the communication modes, environments, time and planning tasks that are to be performed.

	Communication Modes		Communication Environments		Communication Time		Planning Activity Context		
Deliberation types	Co-located	Dispersed	Real World Settings (Offline)	Virtual (Online)	Synchronous	Asynchronous	Consultation	Design	Problem and Strategy Setting

Table 1: Deliberation typologies in modern planning arenas

These deliberation types represent all the possible forms in which deliberation can happen in modern planning arenas.

Supporting *deliberation across planning tasks* requires methods and tools for reusing the products of deliberation in one context, in other planning phases, e.g. exchanging information from public consultation meetings and then using it as a reference for technical and political choices. Supporting *deliberation across communication time* means enabling synchronous and asynchronous communication in the same deliberation process, that is to say using information gathered with online deliberation tools to inform face-to face deliberation meetings and vice-versa. Supporting *deliberation across communication modes* means enabling both co-located and dispersed stakeholders to be involved in planning discussion and to be informed on results of planning conversations. Finally supporting *deliberation across communication environments* means enabling integration between online and offline deliberation spaces i.e. using face-to face meeting results to inform web-consultation experiences and vice-versa.

Knowledge media tools offer novel ways to tackle the problem of deliberation capture, representation and management across deliberation spaces. In the following sections we describe the integration of three tools, one standalone and two Web-based, to support capturing structuring and representation of deliberation in Participatory Spatial Planning Practices. We describe how the tools have been integrated and used in the course of three real participatory planning cases. Basing on users feedback, we finally argue that integrating offline knowledge management tools and Web technologies enables more effective capture and integration of deliberation contents between different deliberation environments (Table 1-1), while at the same time enabling better reflection and understanding of the deliberation process.

4. Compendium: a sensemaking tool to map and manage deliberation

Compendium is a hypermedia and sensemaking tool (Buckingham Shum, et al., 2006) that we used as a Knowledge Management system to store, structure and represent deliberation contents. Compendium has been already successfully used in the literature as an argument visualization tool in policy-making (e.g. Ohl, 2008; Renton et al. 2007, Elliman et al. 2006). The use of the tool we describe in this paper is more as knowledge management system for deliberation rather than argument visualization. In particular, an information architecture has been specifically designed to represent deliberation as hypermedia knowledge maps. In this architecture, information units are contributions by stakeholders during deliberation. Each contribution is represented as a node in the hypermedia database, and is indexed according to key descriptors of the deliberation process, which are organized coherently against five dimensions of participatory planning processes: *dialogical*, *social*, *spatial*, *temporal* and *causal*.

Social Dimension: Since one of the main advantages of structuring and representing deliberation is the possibility to draw a picture of the social setting in which planning develops, it is important to trace which stakeholders are making the claim and in which organizational contexts they are involved.

Temporal Dimension: Since deliberation is a process that spans the entire participatory planning process, time is considered key to contextualize deliberation contents to planning actions, so we can track when in the planning process something was said.

Spatial Dimension: The spatial dimension is considered constitutive because in participatory planning processes, people's statements often need to be linked to geographical areas or to spatial objects.

Dialogical Dimension: The dialogical dimension represent dialogues and arguments. This dimension shows the dialogical and argumentative content of the statement and the context of discussion in which it has been raised.

Causal Dimension or Rationale: It refers to the causal chains of arguments that motivate decisions and offers a representation of the planning design rationale.

These five dimensions are heuristic dimensions which have been defined by experimenting information modelling and representation in several planning case study (see following sections for info on SPP, MK, and TG case study). As in a shallow grounded theory approach we have started by analysing video recording of planning meetings, being our elements of analysis the claims raised from the different stakeholders in the meeting. Every time we isolated a claim we had a broad question in mind: “What are the questions I need to answer to understand more about this claim?” Then we started coding and grouping the claims according to the answers to this question. Based on this analysis we recognized and defined the aspects that need to be addressed (the question that need to be answered) in order to interpret and understand information and knowledge used and generated during deliberation on participatory planning process.

Five testing categories of deliberation contents, reported above, emerged directly from the data, and, of course, from our interpretation of the research question and of the analyzed phenomenon. The five dimensions define the aspects of the deliberation process that need, or use to be, recollected during a Participatory Planning Process. They constitute an information taxonomy that has been used as data collection framework to annotate and classify deliberation contents, and then represent them in the hypermedia database.

The information taxonomy of deliberation contents was tested in a pilot project to represent the contents of a participatory planning process conducted in a southern Italian town, San Pietro Piturno (SPP). SPP case study was conducted within a neighbourhood regeneration programme in a small municipality in the south of Italy (Putignano, Puglia Region). The non-profit organization (ISF, Engineers Without Frontiers) involved in the participatory process, made its data available to evaluate the case study results, and the planners involved in the planning process at institutional level participated in the evaluation phase.

In this case, we tested Compendium’s capability to capture and represent deliberation within the consultation process with the SPP local community. Evaluation data was gathered from three sources:

- Lab-based observations: Behavioural observations of two pairs of planning experts exploring the Compendium system, plus four individuals
- Semi-Structured expert interviews: Four semi-structured interviews to test general reactions and explore possible uses of the system for different tasks and different expertise. The interviews were with representatives at different organizational levels (community, technical and political) including an NGO, Decision Makers, Institutions and Spatial Planners
- Questionnaires: issued to planning students after testing the system’s usability and information architecture.

The main aim of this case study was to test the information structure and deliberation contents taxonomy and how effective it is to reconstruct and represent the deliberation process (for details of the San Pietro Piturno case study see De Liddo, 2008, chapters 9-10).

Figure 1 illustrates how deliberation in a community meeting was structured and represented in Compendium in a *Dialogical* view. This was created by a knowledge mapper, who extracted and mapped contributions from videos of the consultation meetings, creating a hypermedia database. The dialogues are structured using the Issue-Based Information System (IBIS). IBIS provides a simple structuring notation distinguishing between issues, positions on these issues, and arguments for and against these positions (Kunz and Rittel, 1970). By following the argumentative chain, one can observe roles, trust relationships and decisional steps. By modelling the five views on the deliberation process as a hypermedia space, Compendium provides a

FM is a tool developed within the Open University's FlashMeeting Project (<http://flashmeeting.open.ac.uk>). Although FM was designed to support online video-conferences, we also used FM to create reusable deliberation records from face-to-face meetings, since it provides a set of useful features:

- Meeting recording and replay (within a web browser)
- Who is speaking at any moment
- How many times and for how long they spoke (generating analytics for the moderator)
- Annotation of important moments of the meeting (sharing this with the stakeholders live during the meeting and/or making it available in the replay)
- Annotation of spatial object on maps collaboratively manipulated during the meeting (possibility to take different snapshots of the same map, taking trace of the different annotations along the meeting, taking trace of the map evolution)

In the Compendium-FM integration, video of meetings which was annotated in FM during meetings (as one would take notes). These annotations were then imported into Compendium populating the hypermedia database. This integration thus seeks to combine the richness of video for recovering and reconstructing meaning, enriching the terser summaries captured in Compendium. We argue that this improves the transparency of the deliberation process: stakeholders can go back to the raw information source and make sense of the deliberation process in a unbiased way.

We tested this feature in a quasi-naturalistic case study conducted with a group of citizens in Milton Keynes, UK (MK case study). The aim of this case was to test video annotation of face-to-face meetings, in the ongoing phase. We tested FM and Compendium to track a group meeting (consultation meetings or technical team meetings) in which participation was limited to a small number of known people. Participants were all Milton Keynes citizens, so held a real stake into the discussion. Between them, a key role was played by an officer of the Milton Keynes Development Corporation, who enriched the discussion with real knowledge and direct experiences of the planning process and its development during the 1970s. All participants were invited to discuss the Milton Keynes Master Plan, and to deliberate about future lines of development for the city. The face-to-face meeting was recorded and live annotated with FM. The annotations were later exported to Compendium, where each annotation was automatically converted into a node in a hypermedia map, and it could be associated with a specific point in the FM video replay.

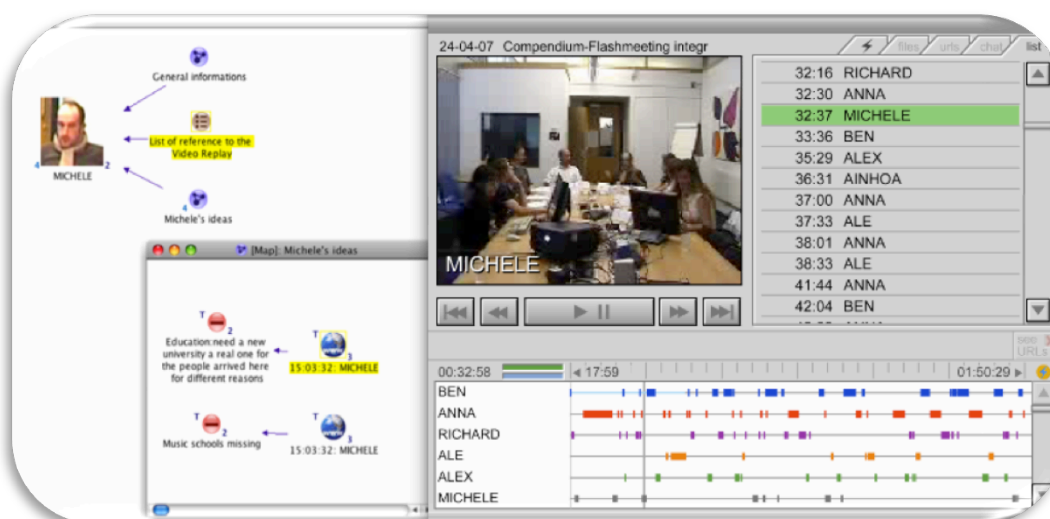


Figure 2: Compendium-FM integration: Nodes in Compendium maps (background) are hyper-linked into the relevant point in the FM meeting replay tool.

Figure 2 shows the FM replay tool: each participant has a timeline showing when s/he spoke. This is launched by double-clicking on an imported, video-indexed node in Compendium, which the mapper has linked to a contribution in a Dialogue Map (as in Figure 1). The link back to the source material makes it easy for anyone to verify that the map is an appropriate summary of what happened. This case study demonstrates how the deliberation process can be made more fully transparent and open to critique (for details of the MK case study see De Liddo, 2008, pp. 102; pp.121-124). Without digital indexing of the deliberation process and instantaneous access to the relevant point in the video record, such verification would be much harder, and in most cases, would never happen.

6. Enabling asynchronous online deliberation: Compendium-CoPe_it! integration

Traditional methods of deliberation and public participation normally require face-to-face, synchronous interaction between citizens, planners and decision makers — the contexts which we have discussed so far. However, the costs of coordinating and hosting such meetings can be high, and of course, they are not necessarily the best way to elicit reflective viewpoints from all relevant voices. Asynchronous online deliberation platforms may, at least for those comfortable with the internet, reduce the costs of participation while enlarging the participation base.

We therefore integrated the offline Compendium tool with CoPe_it!, a web-based tool supporting collaborative argumentation and decision-making in online communities of practice (Karacapilidis and Tzagarakis 2007). CoPe_it! supports the definition of alternative solutions and the analysis and evaluation of the contents in order to drive groups through decision making processes. We developed an import-export of Compendium hypermedia maps for CoPe_it!, enabling online users to contribute statements and arguments (claims, comments or ideas) to the Compendium maps (Figure 3).

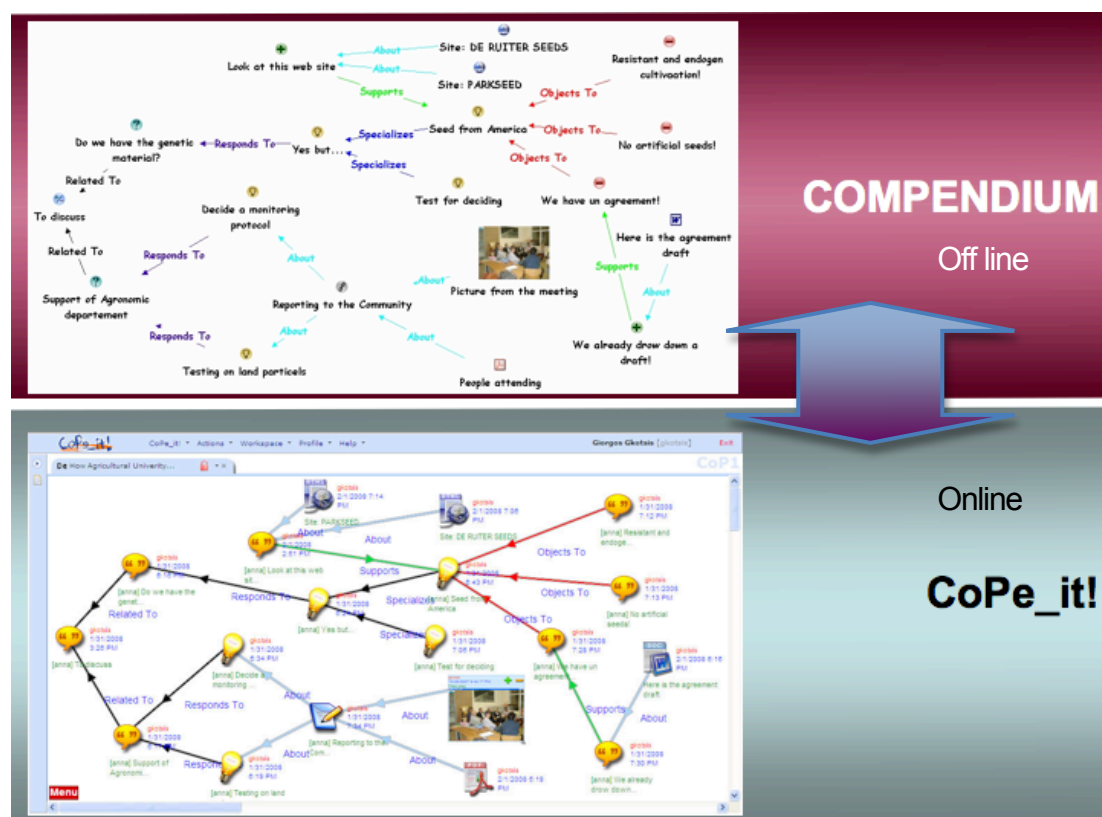


Figure 3: Offline-online Dialogue Map integration: import from the offline Compendium tool into the online CoPe_it! tool.

The Compendium-CoPe_it! integration was tested in a participatory planning case driven in the southern Italy community of Torre Guaceto (TG). This case study is not a conventional planning activity, but concerned the activities performed by a community of farmers to enhance their biological production income. In this case, the planning team was in charge of helping this community of practice to build their past and present project history. Therefore, Compendium and CoPe_it! were used both to rebuild and represent the past history of the community and to capture and represent the new, ongoing activities. The aim was to test the system's capability to capture a deliberation process as it unfolded. Furthermore, this case involved a real farming community of practice, providing the opportunity to investigate participatory planning activities outside an institutional environment, where we could better appreciate the differences and difficulties of working with local communities in their environments and with their communication protocols (for details on the TG case study see De Liddo 2008, pp. 101; pp 105-117).

From a technical perspective, the case study showed that, Compendium and CoPe_it! have high integration potential mainly because they share similar communication principles and visualization languages. Maps developed offline could now be posted in almost identical form for online discussion, and vice-versa. Nodes' positions, label, images, links type and colour scheme were preserved, thus enabling the unbiased and precise identification of user's contributions to the map. Online users could comment on maps from off-line deliberations, and vice-versa.

7. Evaluation

In the previous sections, three case studies have been briefly described in which Compendium, FM and CoPe_it! were proof tested to capture deliberation around different planning activities. Table 4 gives an overview of the evaluation study and of the participatory process phase, time of capturing, meeting environment and gathered information for each case study.

CASE STUDY	Phase of the Participatory Process	Time of Deliberation Capture	Meeting Environment	Information Resources
SPP – San Pietro Piturno	Consultation Meetings	Post hoc, through analysis of the video replay	Real-life, face-to-face meetings.	Videos and actors interviews
TG – Torre Guaceto case study	Community Groups Meetings	On going phase	Real-life, face-to-face meetings and on-line	Life-meeting participation, meeting videos, audio records, and actors' interviews
MK – Milton Keynes Master Plan	Team group meeting	On going phase	Real-life, face-to-face meetings.	Live-meeting participation, meeting videos, screencast, note-keeping maps

Table 4: Case studies overview by main characteristics

Moreover, Table 5 summarises how the combined application of the three tools can effectively support the capture and representation of deliberation in different communication environments and while performing different planning tasks. We see that Compendium supports Co-located, Offline, Synchronous deliberation; while FM supports both Co-located and Dispersed communication modes and Online and Offline deliberation through post-hoc annotation of meeting videos; finally CoPe_it! supports Dispersed, Online Synchronous and Asynchronous deliberation. (Table 5 acronyms: SPP-San Pietro Piturno mentioned in §4, MK-Milton Keynes mentioned in §5, and TG-Torre Guaceto mentioned in §6; the shaded cells show which tool were used by case study and activity).

	Communication Modes		Communication Environments		Communication Time		Planning Activity Context		
Deliberation types	Co-located	Dispersed	Real World Settings (Offline)	Virtual (Online)	Synchronous	Asynchronous	Consultation	Design	Problem and Strategy Setting
<i>Compendium</i>	X		X		X		SPP	TG	MK
<i>FM</i>	X	X	X	X	X				MK
<i>CoPe_it!</i>		X		X	X	X	TG	TG	

Table 5: Deliberation typologies supported by each tool, and planning case studies (by acronym SPP, TG and MK) in which each tool was tested.

Although it is out of the scope of this paper to provide detailed descriptions of the case studies and data analysis, below we provide some of the stakeholder feedback gathered (quotes, translated from Italian, are italicised), and some of the key evaluation results. Those come in particular from the usability study conducted within the SPP project, and summarize quotes from three kinds of stakeholder: planning practitioners (from NGO and Local Government), planning scholars and planning students.

Overall, users “*consider the tools very useful*” to provide a rich representation of the deliberation process that can be used to reflect on planning decisions and to support decision-making; for example: “*the categorization of information (the information architecture) provides rich data about the deliberation process and these data can be analyzed and used in many different ways to support the decision-making process*”. Compendium can “*offer a rich representation of the critical issues for decision-making such as: defining what is the problem; what are the objectives; and supporting decision maker to reflect and look for alternatives*.” Moreover users particularly appreciated the use of the tools “*to support reflection in action*”; they describe the groupware as a “*means to investigate the process, to understand the problems, to explore solutions and also to understand how to make these solutions operational on the territory*.”

Users recognized the advantages of using the tools to trace and represent design deliberation in that they can help stakeholders to make sense and “*to argue about the evolution of any kind of event that involves several stakeholders*.” They thought that the tools could help to reflect on deliberation in order “*to investigate and to find the right balance and combination between community needs and exploitation of local resources and potentials*.” If used in this way these tools could “*help to draw a plan that is more compatible with the community interests and demands*.” Moreover, by supporting reflection and allowing deep analysis of the deliberation together with the social context which generated it, users considered that “*those technologies can be used to continuously revise and adjust the plan to the community needs*” as long as the deliberation record grows and evolves together with the planning process and with the social context.

8. Conclusions and Future Work

In this paper we have argued that the *deliberation process* is central to an authentic understanding of participatory planning practices. This has motivated a series of discourse technology integration projects to make deliberation more transparent, that is, recording discourse digitally to make it possible to interrogate the planning project memory in ways not possible with conventional documentation, thus making it more rigorous, useful, and accountable.

Each tool integration seeks to address a different facet of this design challenge. Working from videos of community meetings, Compendium was used to index stakeholders’ contributions against important five dimensions of participatory planning processes: *dialogical, social, spatial, temporal* and *causal*. The FM videoconferencing tool already makes it easier to navigate and replay an online meeting by participant and annotation, and its integration with Com-

pendium helps further to preserve transparency by providing instant access from terse, semantic hypertext Dialogue Maps, back into the original moment in the richer video. Compendium's integration with CoPe_it! addressed the potential weakness of a single analyst constructing the record of a face-to-face offline consultation, by enabling the wider community to check, annotate and extend the map online consultation.

We propose that the work summarised in this paper provides evidence that hypermedia discourse tools help move us from a deliberation process which is often ephemeral, ill-structured and disempowering, to deliberation which is persistent, more coherently structured and participatory.

There remain some significant challenges to investigate as deliberation mapping tools, such as those described here, begin to mature and become embedded in planning practice. Since Participatory Planning aims to enlarge involvement of the community in the planning process, we now need to engage with the public. In the case studies presented, we have engaged mainly with planning scholars and practitioners, and have investigated the technical aspects of how deliberation processes can be effectively captured across planning tasks, communication modes, time and environments, by integrating and using hypermedia, groupware technologies. We now need to engage with the public and understand how a community interacts with those technologies.

Moreover, as suggested by the expert interviews with a representative of the Regional Planning office, issues of power can occur: "...if we talk about the political and administrative class, I have to admit that those environments are very resistant to change. It could be really difficult to introduce any kind of innovation in the administrative process. There is a cultural resistance to innovation. On the other end, politicians see as dangerous everything that could undermine the spaces and procedure in which unilateral decision develops."

Thus, the accountability that comes from such tools may not be welcomed by all stakeholders, since they redistribute power and control. If, however, authentic participatory planning is not only a fine ideal, but a necessity in order to create sustainable, adaptive communities and decision making processes capable of meeting today's challenges, then we argue that such tools could play an important role.

The "ideal" design for a deliberation platform requires no supervision, but is so cleverly designed that when opened up for mass participation, it still delivers coherent debates and summaries. Setting such high expectations of a platform may be unrealistic, leaving open the question of when and where human intervention is needed to make sense of what is going on. In this view, *platforms*, *people* and *practices* must co-evolve: understanding the "architecture of participation" (to adapt O'Reilly's, 2004 concept from open source code) around these tools is critical, in order to specify the roles and skillsets needed. We are not yet sure that untrained users can make effective use of deliberation mapping tools, so we continue to study the role played by expert "cartographers" in curating project memories of this sort.

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